

1 Introduction

Critical scrutiny of 'science' and its place in governance has never been more pressing. Attempts to shape social, economic and environmental processes have always been inseparable from how those processes are understood. Yet at the start of the twenty-first century, this is ever more complex and globally interlinked, especially in the field of environmental science and policy. International governance regimes are proliferating, and with them emerging roles for science: in the determination of key questions, analytical frameworks, negotiating stances and the monitoring of compliance. Regional and national policies and the politics and inquiries informing them, must be shaped in articulation with global debate.

Contradictory tendencies appear to run counter to this increasing internationalisation. The presence of non-governmental organisations, public pressure groups and 'indigenous people' in the streets, on the television and at times in the negotiation chambers of international deliberations defies simplistic pictures of nation states and their scientists forging international orders. Various forms of social movement and citizen action stake claims and protests on the basis of very different knowledges and perspectives. National and international policy institutions alike make attempts to access and include 'local voice' through a host of 'participatory' and 'stakeholder-inclusive' procedures. Yet important questions arise about the extent to which the power and resources entwined with dominant perspectives circumscribe the emergence and influence of alternative views.

Public engagement with science has never been a simple enchantment. The killing of scientists in Mao's China, and the suppression of genetic science in the former Soviet Union or to fundamentalist religions in the USA, underscore the extent to which the conduct of science is part of social and moral struggle: struggles to shape society in particular ways. Several commentators have, however, discerned a new moment of heightened moral concern and transformed public engagement with science. The public are seen to be more distrustful of 'expert' institutions and their knowledges, questioning the values, risks and uncertainties they embody, and demanding new

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Changing Perspectives on Forests: Science/Policy Processes in Wider Society

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sorts of dialogue (e.g. Beck 1992; Lash *et al.* 1996; Adam *et al.* 2000). This contemporary writing on science and society (and the examples used: biotechnologies, industrial food hazards, nuclear physics and so on) has a strong focus on the 'high tech' of Europe and North America, and the uncertainties generated by rapid technological change. In the very different context of rural settings in low-income countries, are these science-society debates not also relevant? Might they carry different, and in many ways more pressing, implications, shaping the poverties and destinies of those who depend on rural resources for their livelihoods?

Research during the last 10 years of the twentieth century on rural environmental issues revealed that there are frequently major gulfs in analysis as well as aspiration between the perspectives of local land users and those underlying and driving policy. In Africa, for example, and whether concerning rangelands, population-environment relations, soil erosion or forests, prevailing science/policy perspectives frequently blame local populations for environmental destruction. These have provided a justification for removing resource control from land users in favour of control by national and international administrations, frequently contributing to further impoverishment. Alternative perspectives, emerging from different strands of scientific debate and from land users themselves, have suggested different patterns of environmental change, and different resource control imperatives (see, e.g. Tiffen *et al.* 1994; Fairhead and Leach 1996, Scoones 1995, Leach and Mearns 1996). Such findings have provoked a new generation of research on environment and development, which looks much more critically at how problems and solutions come to be defined, by whom, and with what effects. And it asks particularly about the implications for local land users, especially the poorest.

This *Bulletin* extends this approach particularly in relation to forests in Africa and the Caribbean, where it thus explores contemporary relationships between science, policy and society as they affect the rural poor. Tropical forest issues provide a revealing lens to do this, since they are deeply implicated in both local livelihoods and political economies, and in a set of globalised debates around biodiversity, climate change, etc. in which the political and financial stakes are high.

The contributions address two sets of issues: (1) How are 'scientific' perspectives on forest ecology and dynamics changing and how are these altering the ways that forest landscapes and societies might be understood? (2) What is the nature of contemporary science/policy processes in the forestry and conservation field? In particular, how and why do particular perspectives come to influence policy; or are persistently excluded from them? This second set of articles challenges any notion that science and research feed into 'policy' in a linear fashion. Instead, they reveal multiple ways in which international, national and local forest knowledges are entwined with institutional struggles for authority and resources, and the broader social and political relations in which these are embedded. In this context, exerting change in perspectives on forests is not straightforward, but comes to require a broader set of transformations in the ways that science/policy processes operate.

2 Changing perspectives on forests

While tropical forests may lack the sense of rapid technological advance and associated risks, which preoccupy contemporary science and society debates, forest ecology has, for a number of years, been on the cusp of major reconceptualisation in its core assumptions. Forests have long been analysed as if they were stable and equilibrial: as vegetation communities specific to climatic and other conditions which reproduced themselves, and if disturbed within limits, would eventually revert to their original form. Models for applied management from colonial times onwards were based on these assumptions, and hence on the view that vegetation succession could be directed for economic or environmental ends. These views have also underlain images of forest vegetation as existing in a 'natural' equilibrial state until converted to cropland, fallow or, in drier areas, savanna, in one-way processes of human-induced 'degradation'. Certain images of society follow: minimal populations growing only recently, and people degrading the resources they depend on through irresponsibility, poverty or population pressure, with destruction sometimes augmented by external logging or plantation interests. Policy responses have frequently turned on excluding users from forest reserves, groves and parks, even

where these are to be managed with local 'participation', community involvement or compensation.

While such core assumptions of stability always had their dissenters, during the latter decades of the twentieth century they became more thoroughly challenged by research in several disciplines. Articles in the first section of this *Bulletin* review some of these challenges, especially as emerging in three main areas:

- 1 Analyses of climate and vegetation history now suggest major fluctuations in forest cover and quality over recent centuries and millennia. As Jean Maley reviews for Central and West Africa, drawing on his own and others' path-breaking research in paleo-ecology, many forest areas are now understood to constitute regrowth, following a dry phase ending only several centuries ago. On the forest margins, the forests are still expanding into savanna. These vegetation and climate dynamics devastate conventional views of a stable forest 'nature'.
- 1 Recent work in forest ecology underscores these more dynamic views. In line with perspectives in what has been termed the 'new ecology' more broadly (see, e.g. Botkin 1990), many forest ecologists now suggest the importance of disturbance events and path dependency to forest dynamics, quality and species distributions (e.g. Hawthorne 1996, Sprugel 1991). Van Rompaey, in his article, outlines how these shifts in perspective are leading to redefinitions in the status of West African forests, drawing attention, particularly, to the contrast between the high species diversity of the wet evergreen zone and the low species diversity of the moist semi-deciduous zone. As Hawthorne (1996) puts it in related work, much of the latter (which had been considered as a natural vegetation type) may be 'scar tissue, a recently-assembled group of mainly widespread, well-dispersed species, covering up after some immense disruption of this area' (1996: 138).
- 1 Studies in social anthropology and history show the long-term shaping, in some circumstances enrichment, of vegetation

through local practices, and highlight the relationships between landscape, memory and resource claims (e.g. Amanor 1994, Fairhead and Leach 1996, 1998, Balée 1998). The articles by Gérard Chouin and Paul Sarfo-Mensah both illustrate elements of such work, and its implications, for different regions of Ghana. Chouin reconceptualises 'sacred groves' in humid coastal areas in relation to the path-dependent products of socio-political dynamics, drawing attention to diverse, and social processes of forest creation and usage. Sarfo-Mensah shows how complex forest-savanna dynamics are (in local interpretation) part of a social landscape, shaped by the shifting powers of elders and youth, and changing perspectives on a variety of spiritual forces.

While much of this work has proceeded in parallel, within the confines of different disciplinary debates and institutions, drawing it together suggests some strong convergences. Vegetation patterns come to reflect the real historical legacy of many interacting influences, human, ecological and other, over many, overlapping timescales: what one might term a 'dynamic landscape perspective' on forests. At the same time, assessing forest cover, quality and dynamics becomes subject to far greater uncertainty. Forest dynamics are both inherently unpredictable given the multiple (sometimes chaotic) influences on them, and open to multiple interpretations and values as, for instance, different local users, timber companies, ecotourists and those promoting global biodiversity conservation all have different perspectives on what a desirable forest would be like. Karen Biesbrouck, in her article, reflects on some of the policy challenges which arise when forest degradation or sustainability can no longer be measured against 'natural' (and moral) baselines, but comes to involve, as she puts it, 'choosing one dynamic equilibrium over others'. As she suggests, this undermines the grounds for removing resource control from local communities, while strengthening arguments for their inclusion in strategic deliberations over forest futures. As she illustrates for Cameroon, such a model departs quite strongly from the tokenistic involvement, which has characterised many so-called forest 'co-management' approaches, although it also

encounters challenges given the social differences and dynamics that pervade and cross-cut 'communities' in such African settings. Other works have outlined further policy approaches which might flow logically from such a dynamic landscape perspective. These include a shift from 'blueprint' to more flexible, adaptive management approaches to sustainable timber production, conservation, etc. (see McNeely 1999, Fairhead and Leach forthcoming) and a reconsideration of assumed separations between people and 'nature', to assess how diverse forestry and conservation objectives might be pursued in lived-in-landscapes.

However, this *Bulletin's* 'story' cannot stop at suggesting the specific implications for policy and practice suggested by new perspectives on forest landscapes. To do so would assume an unproblematic, linear relationship between research and policy. It would assume that to change policy, new findings simply need to be assembled with sufficient clarity and critical mass, and 'disseminated' to policy-makers. Instead, as the second set of articles illustrates, scientific and policy processes as they relate to forest issues in Africa and the Caribbean are far more complex, and socially, politically and historically embedded. In different ways, each article draws on and contributes to a growing body of focused work on policy processes and their interrelationships with science, to examine the evolution of science/policy debates and their framing. Each traces patterns of authority and exclusion and their material effects, and discerns how specific interactions between local, national and international processes influence this.

3 Forest science/policy processes

Thus, the second set of articles in this *Bulletin* explores science/policy processes as they operate in, and in relation to, West Africa and the Caribbean. They focus on different areas of forest policy debate, ranging from biodiversity conservation and sustainable timber production, to fire and watershed management. While each treats engagements of science and policy as involving interactions of local, national and international processes, they vary in their level of focus. The first three articles of Part II (by Kojo Sebastian Amanor, James Fairhead and Melissa Leach, and Thackwray

Driver) address engagements between local forest users, administrations, politicians and scientists within local and national settings. They are followed by three (by Ruth Malleon, Fairhead and Leach, and Sally Jeanrenaud), which cast their gaze primarily on global discourses and debates, and the ways in which these articulate with more localised processes.

Thus in a national/local West African case, Kojo Amanor explores the interactions of research and policy processes around fire management in Ghana. He shows how powerful discourse coalitions have formed which draw researchers, administrators, NGOs and certain local leaders together around common storylines, such as the view that fire is inevitably a problem. In the process, many other issues, including farmer's own fire use practices and the dynamics of fire ecology, are left unaddressed, excluded from research and policy attention. One outcome is the extension of particular, and pervasive forms of environmental managerialism, which are in many respects damaging to local livelihoods.

The two national/local Caribbean cases both focus on the island of Trinidad within the twin-island Republic of Trinidad and Tobago. Here, James Fairhead and Melissa Leach take a 'science/policy as practice' approach to the evolution of sustainable timber production. Certain research and policy practices have become central to the identity and resource control of particular state institutions, so that inter-institutional struggles for authority and 'turf' are fought partly through science. Playing into these struggles, with varying success, are the perspectives of artisanal timber workers and field-level forest officers, which have developed through different forms of knowledge and experience, and are linked to very different claims over territory and resources. In particular, the article explores how the co-production of science and management and its importance to the national Forestry Division serve to maintain an image of forest stability in the face of a range of ecological and socio-economic uncertainties, and to exclude non-equilibrial alternatives from being seriously countenanced. Thackwray Driver focuses on Trinidad's Northern Range mountains, exploring how a longstanding, powerful discourse about the nefarious effects of 'squatting' has framed

(and been reproduced through) subsequent science/policy initiatives to develop and protect the area's watersheds. The objectification of the category of 'the squatter' through these processes, linked to media and wider popular discourse, has served to exclude attention to the wide variety of tenure arrangements under which people farm in the Northern Range, and their highly varied effects on landscape.

The three more internationally-pitched cases begin with Ruth Malleon's reflections on the Korup forest in Cameroon. This has become an icon in vociferous international debates over approaches to conservation, pitching those in favour of 'integrated conservation with development' and 'participation' against arguments (e.g. from conservation biologists) in favour of strict nature protection. Claims that integrated conservation and development projects (ICDPs) such as Korup have 'failed' fuel these debates. Yet as Malleon argues, neither side has fully acknowledged the ecological and socio-political dynamics which actually explain what is seen as failure, and which suggest that current international models of best conservation practice may be more fundamentally misconceived for West African settings.

Fairhead and Leach explore how concepts and obligations linked to the international Convention on Biodiversity have articulated with existing science/policy practices in the Republic of Guinea. A range of longer-established research traditions (e.g. around medicinal plants and non-timber forest products) has been revitalised amidst new funding and epistemic support, but transformed in meaning, now cast within a global frame. In the process, the perspectives and interests of farmers and certain Guinean researchers in biodiversity as part of lived-in-landscapes have been further suppressed.

In some important respects, Sally Jeanrenaud's article helps contextualise these two West African conservation cases. She reflects on the apparent 'paradigm shift' amongst international conservation agencies towards participatory, people-oriented approaches. Focusing on the case of the World Wide Fund for Nature (WWF), Jeanrenaud suggests that there are a number of structural reasons why this remains either largely rhetorical, or unable to

move beyond stereotypical images and tokenistic involvement of forest dwellers. These include funding structures and the need to appeal to 'northern' publics through crisis narratives, and persistent contest from powerful 'protectionist' lobbies both within and outside the organisations. The article underlines that international organisations are far from homogeneous, but contain diverse communities of interest, promoting sometimes conflicting perspectives. It also draws attention to the importance of the mass-media in mediating relations between science, policy and society.

4 Forest science, policy and society: towards pro-poor agendas

A recurring, and disturbing, theme across all the cases is that current configurations of science and policy around forests are antithetical to the interests of the poor. This is despite both policy moves to 'participation', and certain creative local responses to and uses of powerful global discourses. Not only are forest users, and especially the poorest and least powerful among them, frequently losing access to material resources which are critical for their livelihoods, but they are frequently labelled and categorised in pejorative ways which has a far wider bearing on processes of governance and social change.

In the concluding article, David Kaimowitz makes the case for a 'pro-poor forest science'. He suggests that the ingredients are already there (not least in the rural people's knowledges and dynamic landscape perspectives outlined in certain articles in this *Bulletin*) and asks what it would require for these to become more fully established in policy. Kaimowitz's main conclusion is that researchers need to communicate 'new' perspectives to policy-makers and international publics in much clearer and more compelling ways. Detailed, place-specific findings, he rightly argues, tend to carry little weight against the powerful, simplified narratives on which national and global policy organisations rely, and which are perpetuated in globalised media. While emphasising communication, however, Kaimowitz also acknowledges that, as the case studies in this *Bulletin* illustrate, science/policy processes are embedded in broader power relations, and that promoting 'pro-poor forest science' will involve challenges to these.

How might such challenges proceed? What types of process, institution or new relationships could help ensure that forest user's perspectives and interests genuinely shape forestry agendas, in more than rhetoric, in an increasingly globalised science/policy world? Taking a lead from the structures and processes documented in the cases, a first set of practical implications concerns strengthening citizen participation in science/policy processes. Given the way policy problematics and their interaction with science come to embody social values, issues of participation and inclusion of diverse perspectives need to be considered in relation to science as well as policy. This suggests the need for participatory research strategies in which poorer forest users help to set agendas and questions. Direct forms of citizen participation and consultation in science and in policy-making processes around specific forest issues could valuably be expanded through the growing repertoire of deliberative and inclusionary procedures (DIPs), including citizen's juries, consensus conferences, multi-criteria mapping exercises and others. These help to expose the values and assumptions behind particular social categories deployed in environmental policy-making, and to promote negotiation between diverse perspectives. However, these are unlikely to produce open dialogue and mutual understanding unless there is particular attention to the inclusion of the social groups which dominant environmental problem framings delegitimise; the 'hosting' of DIPs by disempowered groups, and opening up the process to a greater diversity of problem-framings.

More broadly, the articles suggest the importance of building citizens' platforms for expression of interests, demands and perspectives on policy on their own terms, and of promoting aspects of political and legal culture which enable critique. This also extends to broadening participation in scientific culture: building forest user's scientific confidence and skills, and making space for citizen science to inform broader debates, and shape or dictate their terms. Media strategies could be directed to making explicit the evidence, values, and uncertainties underlying particular scientific and policy positions, enhancing and empowering public capacity to critique and engage in science/policy debate. This might include promoting exposition of multiple perspectives on

landscape, history and forest dynamics in national media and education, helping to break down stereotypic stigmatisation.

To balance the dependence and shaping of national research and local research by international agendas and values, support for independent and critical research within national institutions is needed. This could focus on enhancing the capacity of social and natural science to respond to and engage with land users' agendas. It could also build up the constituencies interested in more dynamic, adaptive approaches to forest ecology and landscapes, perhaps involving coalitions of ecological and social scientists, citizens and policy/NGO groups.

To complement and assist these approaches, building better-informed and more reflexive national and international processes is important. In particular, to address the somewhat biased and self-referential nature of international science/policy debates over forest issues, new procedures will be needed in these which allow perspectives from local settings to feed upwards into and shape terms of debate. This may, however, run counter to perspectives seeking to harmonise local and global analytics and the forms of managerialism they strive for and promote: a managerialism illustrated strongly by several of the *Bulletin* cases.

5 Understanding science/policy processes

Before turning to the cases, we want first to sketch out a variety of theoretical traditions which inform analysis of science/policy processes, to contextualise and introduce some of the key concepts employed by the authors of the science/policy articles here. This subject has become something of a research fashion. Disciplines and sub-disciplines for which this has been a longstanding concern, such as political science, or history, which has long studied the policy processes of colonial and post colonial states, for example, have been joined by others, forwarding their own emphases and concepts.

Many anthropologists coming to a specific interest in policy, for instance, emphasise links between power and knowledge. Some draw on the work of

Michel Foucault, who in many works traced historically how particular problems have come to be constituted as an object of certain forms of knowledge and a target of certain institutional practices, and how together this shapes social and material inequality. His approach considers how modern science is constitutively interdependent with the evolution of practices for the surveillance, discipline, administration and formation of populations. To capture this co-evolution, he uses the shorthand *pouvoir-savoir* (power/knowledge), which resembles, in some respects, 'science/policy' as used in this *Bulletin*. To capture the singularity of the field of inquiry he refers to it as 'discourse'. Discourse need not merely act on individuals but can produce its subjects, through a combination of external 'subjection' and internal 'subjectification' (Shore and Wright 1997).

The notion of discourse draws attention to the ways in which the apparently technical language of policy and 'Science' may conceal highly political interests. In this vein, writers such as Ferguson (1994) and Escobar (1995) have argued that development policy discourse emanates from and reproduces the power of the state and its international sponsors. Such work is focused on the effects of policy, not its formulation, with Ferguson tracing the extension of bureaucratic intervention in rural areas, often at the expense of local resource control to development discourse.

Some have explored narratives as a feature of discourses (see Biesbrouck and Jeanrenaud, *infra.*). Simplified stories (e.g. of environmental change and its causes) describe problems, identify and label their perpetrators, and justify proposed solutions. Such narratives are, it is argued, an integral facet of policy-making, regardless of what particular policy-makers might actually understand or think about the world. Policy necessarily acts on a simplified version of 'reality' and requires a clear cultural script for action.

Work in the sociology of science has also problematised the ways that social and political values inform the setting of scientific agendas, the way scientists work, and the ways they reach their conclusions. Scientific knowledge 'embodies implicit models or assumptions about the social world' (Irwin and Wynne 1996: 3). One can trace

at least two motivating forces within the sociology of science. The first comes from the history and philosophy of science itself, which endlessly illustrates the temporary truth claims of scientific ideas. A second set of motivations stem from the frustrations with science felt by those whose own concerns, or the concerns of those for whom they speak, are marginalised, misconstrued, delegitimised or silenced, along with economic and political claims relating to them. This is the case, for instance, for feminist critiques of science and social science (Haraway 1988, Harding 1991), as well as Marxist and anti-colonialist critiques of science going back to the 1930s. Indeed this has motivated our own interest in the subject; in the ways dominant forest science has silenced the perspectives and interests of African and Caribbean farmers and land users (a motivation shared by a number of the contributors to this *Bulletin*). Such scepticism with its origins in political experience is easily transformed into a methodological scepticism towards all science. Scientific knowledge is created by people and institutions with particular situated and partial perspectives. Official ideologies about objectivity and scientific method may be bad guides to how scientific knowledge is actually made (Haraway 1991).

Certain analytical traditions in science and technology studies explicitly consider international dimensions to science. Reviewing these, Schrum and Shenhav (1995) distinguish works rooted in theories of modernisation, theories of dependency and theories of power, knowledge and institutions. Modernisation theory considers how science and technology leads to (or even constitutes) progress and development. Dependency theory sketches out the inverse: how 'western science' is another mechanism of domination, producing the technological means for the subjugation of the masses, and acting as an ideological force and inappropriate development model. Institutional theory, in contrast, explains the adoption of structurally similar forms of science throughout the world, and assumptions concerning the universality of science, and its necessity for modernisation. It considers the processes through which scientific institutions and beliefs are prescribed and diffused as a key component of the modern world system. While such institutional alignment might promote comparability, it does not promote solutions to local

problems (see Amanor and Fairhead and Leach, *infra.*). Although apparently developing in tandem with them, this focus on the institutionalisation of particular forms of knowledge strongly resembles analyses in anthropology and history rooted in the Foucaultian tradition.

For all their differences, these analytical traditions are rooted in structurally-focused analysis. Aware of the limitations this places on understanding science/policy processes, most of the case study authors in this *Bulletin* have therefore sought to combine them with other concepts and approaches.

Even a cursory look at different people engaged in producing, experiencing and implementing science/policy reveals problems in a monolithic or homogeneous view of 'policy' or 'development' discourse and its narrative components. As Grillo (1997) has argued, and as several more recent ethnographies demonstrate, development is conceived of in multiple, sometimes contradictory, ways by the actors and institutions involved in it (e.g. Harrison 1995, Pigg 1992, Sivaramakrishnan and Agrawal 1998). While different theoretical positions partly reflect methodology, with approaches exploring science-policy-development across countries and over long timescales perhaps more likely to observe structural regularity and to essentialise 'monolithic discourse' than those using fine-grained ethnography to reconstruct interpersonal interactions, the differences go beyond methodological artefact. Casting discourse as monolithic has the effect of absolving those involved of reflective consciousness, agency, and responsibility, and of obscuring their multiple axes of identity. At the very least, it obscures the everyday dilemmas and situations of interaction faced by scientists and administrators, and the ways they respond to them. This leads to a third limitation: the reduction of interactions between administrations and local populations to a confrontation of discourses, falsely casting their interaction as one of assimilation or resistance to singular processes (Long and Long 1992, Grillo 1997, Sivaramakrishnan and Agrawal 1998).

A large and rather eclectic variety of theoretical positions place more emphasis on the multiplicity of people and perspectives implicated in science/policy processes. Each seeks to retain an

analytic which can account for structuring whilst not losing sight of agency (see Giddens 1984). In the sociology of development, a tradition of 'actor-oriented' approaches has emerged which emphasises the intentionality of conscious subjects, their interpersonal interactions, and the ways people actively strategise to represent issues in certain ways and forge alliances in promoting them (e.g. Long and van der Ploeg 1989, Long and Long 1992). A major analytical focus has been on the actions of local representatives of state and NGO bureaucracies, such as forestry extension officers, their lifeworlds, and the ways they relate with both policy 'beneficiaries' and with other actors in state and development agencies (see Fairhead and Leach *infra.*). By disaggregating bureaucracies and seeing them as embedded in social and political processes, the divide between 'state' and 'community' or 'citizen' becomes much less clear; instead sets of social relations and institutions cross-cut and dissolve such boundaries. 'Structure' in such accounts comes to be seen as the cumulative product of multiple actions and interactions, which in turn influences subsequent courses of events (Long and van der Ploeg 1994).

Similar perspectives are apparent among certain political scientists and analysts of public administration. Grindle and Thomas (1991), for example, emphasise the strategising behaviour of 'policy entrepreneurs' who take advantage of the opening of policy spaces to effect change. Political science research which focuses on what bureaucrats and state agents actually do has also shown how local level implementers such as extension agents (whom Lipsky 1979 calls generically 'street level bureaucrats') can exert considerable agency in the policy process. This is in the ways they interpret directives, deal with contradictory instructions and ideas, take initiative and exercise discretion. Joshi (1997) provides an example in the forestry field, showing that forest extension workers were in fact the prime-movers in a major policy shift from state-controlled to devolved forms of forest governance in the case of Joint Forest Management in West Bengal.

This work fits broadly within a longstanding perspective on policy as the outcome of contests between different political interests (e.g. Dahl 1961, Truman 1951). Yet traditional divisions between

'state-centred', 'society centred' or even 'organisation centred' perspectives have been undercut by work showing how policy communities, networks and advocacy coalitions link shared interests across divisions within governments, pressure groups, business interests and so on (e.g. in the works of Jordan 1990, Coleman *et al.* 1997, Sabatier 1988). In this respect, Haas gives analytical weight to trans-institutional networks of people who share common analytical perspectives (epistemic communities), and their strategising, in bringing about international agreements (1990, 1992). The notion of epistemic communities is used productively here in Jeanrenaud's analysis of international conservation.

Hajer (1995) qualifies this work in an approach that influenced Amanor's article (*infra.*) in particular, arguing that:

...in the struggle for discursive hegemony, coalitions are formed among actors (that might perceive their position and interest according to widely different discourses) that, for various reasons, are attracted to a specific set of story-lines... *Discourse coalitions* are formed if previously independent practices are being actively related to one another, if a common discourse is created in which several practices get meaning in a common political project. (Hajer 1995:65, our emphasis)

Turning to science and technology studies, similarly, ethnographic approaches have also developed since the 1980s, which eschew any notion of a monolithic 'science' or 'scientific community', instead studying science in its practice (what scientists actually do), and attending to the action, agency and culture of particular scientists (Pickering 1992:2). Actor-network theory, for instance, scrutinises the practices by which scientists create facts through closing controversies, boxing-off ('black-boxing') uncertainties and assumptions away from further scrutiny, and extending the reach of locally-specific knowledge (i.e. derived from particular field sites or laboratory experiments) through enrolling actors and institutions in broader, even globalised, knowledge networks (Latour 1987). Only in this way can scientific findings proceed outwards, from local settings to more universal claims.

While these approaches foreground the agentic aspects of making knowledge, they attend to structure in at least two ways. One is in a notion of scientific culture as a field of resources that practice operates in and on, which in turn is reconfigured through practice. The other is in the way that the networks formed of actors and their practices themselves come to operate as structures, themselves influencing subsequent courses of action. Some (e.g. Knorr-Cetina 1999) consider that the attention to structure does not go far enough, however; her work on 'epistemic cultures' thus reflects on the broader 'orientations and preferences that inform whole sequences of action, the structures built from combinations of such sequences' (Knorr-Cetina 1999:9), including particular framings of the problem, research technologies, social configurations and networks of scientists, funding contexts and laboratory settings.

In a similar approach (e.g. in Fairhead and Leach *infra.* and forthcoming), we have endeavoured to treat 'science' and 'policy' as constellations of component practices and procedures as enacted by people and institutions, but also as structuring their choices. Ideally, this perspective allows each practice (each workshop, meeting, report, legislative decision, funding flow, etc.) to have its own biography and sedimentation of meanings, which at once contributes to 'policy' without conforming to any particular totalising narrative of its evolution, enactment, or meaning. Practices that are 'scientific' also have their own specificity (reviewing species lists, characterising ecological zones, listing the forces leading to degradation), and need not conform to any totalising narrative of scientific method and scientific advance. Specific practices, viewed in this way, become linked within institutional and interpersonal networks, whether intentionally-forged or more circumstantial, coming to frame problems and approaches to them in certain ways.

Many of these processes, problem framings, funding contexts, etc., are also highlighted in literature on the co-production of science with policy (see Jasanoff and Wynne 1997). Scientists contribute to the framing of policy issues by defining what evidence can be produced and its policy significance. Reciprocally, those working in policy also frame scientific enquiry by defining areas of

relevance, and pertinent questions for investigation. Thus emerges a field of mutual construction or 'co-production' which can become self sustaining, as is argued to have happened, for example, in the reliance on general circulation models in climate change research (Shackley and Wynne 1995). Many other processes also contribute to the 'framing' of science by policy and vice versa. Frequently it is in policy contexts or for policy reasons that the meetings and conventions in which scientists come together are held; the framing of those policy meetings is in turn the context in which scientific debate is conducted and which shapes its focal issues. Such co-production also occurs at a second level; participation in policy lends credence to calling practices (such as listing species) 'scientific', and political action based on science gains credibility to be called 'policy'. In these processes of mutual construction, other possibilities, e.g. other types of scientific inquiry, interrelated with other policy options, are curtailed.

Equally obscured in the mutual construction of science and policy may be areas of uncertainty or unresolved debate within science. As Wynne (1992) and Keeley and Scoones (1999) argue, uncertainties may be well known but conveniently ignored. On other occasions caveats may be present in scientific papers, but become obscured through the processes of generating science/policy, creating a false sense of certainty (Keeley and Scoones 1999). At other times, scientific methods and models that hold true under certain conditions (e.g. in laboratories) may be caught out in real life situations by unanticipated variables (see Wynne 1992). Or there may be fundamental indeterminacies in nature, as are recognised, for instance, in non-equilibrium scientific perspectives on forest ecology. Wynne (1992) suggests that in the process of mutual construction, indeterminacies (unresolvable by science), when not ignored altogether in policy, are frequently presented as deterministic uncertainties which can be known with further work. This both justifies continuing scientific business as usual, and retains the hope of prediction, management and control.

In general, work on co-production underlines the inadequacy of analysis couched in terms of distinct

'research communities' and 'policy communities', and how the interface between them might be improved.

The analytical approaches that we have reviewed here, albeit briefly, construe the conduct of science and of policy as the subject of ethnographic enquiry, which must focus on particular practices, contexts and histories. However, the theoretical takes differ in how they conceptualise practice, agency and structure, and this strongly influences the depiction of context. Thus some do not problematise agency or draw on simple notions of personal or social interest; some see agency as discursively constituted subjectivity, and some see it as a hybrid of nature/technology/culture. Others treat science/policy in ways which echo Foucault's power/knowledge, although tempered by the need to acknowledge these issues of agency; of human agency with all its ambiguities and possibilities for and disputes over attribution, and the agency of realities (including ecological ones) that do not obey their social constructors. In theorising agency differently, the approaches, and the articles in this *Bulletin* which variously draw on them, suggest different points of leverage for any transformation in science/policy.

Finally, and as the *Bulletin* articles make clear, scientific and policy processes are not confined to the interplay of people and institutions directly involved in their making and doing. They are also central to broader political and cultural processes, shaping and shaped by the wider social and cultural relations in which they are embedded. Such wider contextualisation draws attention to, e.g. issues concerning ordinary peoples' relationships with experts as part of the politics of knowledge. Important issues also concern how science/policy processes interplay with wider society through representations in media, education and popular culture, and how these create and reproduce social and moral categories that come to have wider salience in society. And scientific and policy processes also interplay with national (and global) politics, political economy and political histories, and the place of (forest) resource control in these.

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